A discrete event simulation framework for utility accrual scheduling algorithm in uniprocessor environment

ABSTRACT

Problem statement: The heterogeneity in the choice of simulation platforms for real time scheduling stands behind the difficulty of developing a common simulation environment. A Discrete Event Simulation (DES) for a real time scheduling domain encompassing event definition, time advancing mechanism and scheduler has yet to be developed. Approach: The study focused on the proposed and the development of an event based discrete event simulator for the existing General Utility Scheduling (GUS) to facilitate the reuse of the algorithm under a common simulation environment. GUS is one of the existing TUF/UA scheduling algorithms that consider the Time/Utility Function (TUF) of the executed tasks in its scheduling decision. The scheduling optimality criteria are based on maximizing accrued utility accumulated from execution of all tasks in the system. These criteria are named as Utility Accrual (UA). The TUF/ UA scheduling algorithms are design for adaptive real time system environment. The developed GUS simulator has derived the set of parameter, events, performance metrics and other unique TUF/UA scheduling element according to a detailed analysis of the base model. Results: The Accrued Utility Ratio (AUR) is investigated and compared to the benchmark of the modeled domain. Successful deployment of the GUS simulator was proven by the generated results. Conclusion: Extensive performance analysis of GUS simulator can be deployed using the developed simulator with low computational overhead. Further enhancements were to extend the developed GUS simulator with detail performance metrics together with a fault tolerance mechanism to support a reliable real time application domain.

Keyword: Discrete event simulation (DES); General purpose language (GPL); Real time scheduling; Time/utility function (TUF)